Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended): A method of coating a surface of a titanium based substrate to provide oxidation protection and improved fatigue properties at elevated temperatures, comprising:

applying an aluminum conversion layer to the surface to form a coated substrate, wherein the aluminum conversion layer is applied at a temperature below the melting point of aluminum so that ~~which~~ aluminum does not appreciably react with titanium, and wherein the aluminum conversion layer is applied to a thickness of from about 2 to 12 microns; and

heat treating the coated substrate in a two-step process so that:

i) a first portion of the aluminum conversion layer oxidizes to form an alumina layer; and

ii) a second portion of the aluminum conversion layer interacts with the titanium within the titanium based substrate to form titanium aluminide below the alumina layer.

2. (previously presented): The method of Claim 1, wherein the titanium aluminide is formed as a layer having a thickness of from about 2 to 15 microns.

3. (previously presented): The method of Claim 1, wherein the aluminum conversion layer is transformed to the titanium aluminide by heating at a controlled rate above about 500°C followed by a hold at a temperature no

more than about 750°C, and cooling at a controlled rate back down to about 500°C.

4. (previously presented): The method of Claim 1, wherein the aluminum conversion layer is applied by gaseous deposition.

5. (original): The method of Claim 4, wherein the gaseous deposition and heat-treating are performed separately.

6. (currently amended): The method of claim 1, wherein the aluminum conversion layer is applied at a temperature below ~~450°C~~about 300°C.

7-24. (canceled)

25. (currently amended) A method of applying a coating to a brazed substrate comprising:

applying an aluminum conversion layer on a braze of the substrate by gaseous deposition, the layer being deposited at a temperature below the melting point of aluminum so that ~~which~~ aluminum does not appreciably react with titanium; and

heat treating the aluminum conversion layer so that the aluminum diffuses into the braze to form a solid solution within the braze, and the aluminum further oxidizes to form an alumina surface layer on the braze.

26. (previously presented): The method of Claim 1, wherein the titanium aluminide comprises the phase $TiAl_3$.

27. (previously presented): The method of Claim 1, wherein the alumina layer has a thickness of from about 0.5 to 5 microns.

28. (canceled)

29. (previously presented): The method of Claim 25, wherein the braze includes titanium, and the aluminum interacts with the titanium to form a layer of titanium aluminide on the braze.

30. (previously presented): A method for forming an oxidation protective coating on a titanium-based substrate, comprising:

a) depositing an aluminum conversion layer on a surface of the titanium-based substrate, wherein the aluminum conversion layer comprises aluminum;

b) oxidizing a first portion of the aluminum to form an outer alumina layer; and

c) reacting a second portion of the aluminum with titanium of the titanium-based substrate to form a layer of titanium aluminide beneath the alumina layer, wherein step b) is performed at a first temperature, and step c) is performed at a second temperature, and wherein the second temperature is higher than the first temperature.

31. (previously presented): The method of Claim 30, wherein the first temperature is about 400° C.

32. (previously presented): The method of Claim 31, wherein the second temperature is about 700° C.

33. (previously presented): The method of Claim 30, wherein step a) is performed at a temperature less than about 550° C.

34. (previously presented): The method of Claim 30, wherein at least one of steps b) and c) is performed in a vacuum furnace.

35. (previously presented): The method of Claim 30, further comprising: prior to step a), cleaning the surface of the titanium-based substrate.

36. (previously presented): A method for forming an oxidation protective coating on a surface of a titanium-based substrate, comprising:

a) depositing an aluminum conversion layer on the surface of the titanium-based substrate;

b) oxidizing a first portion of the aluminum conversion layer to form an outer alumina layer; and

c) diffusing a second portion of the aluminum conversion layer into the titanium-based substrate, wherein a titanium aluminide layer is formed beneath the alumina layer, wherein step b) is performed at a first temperature, step c) is performed at a second temperature, and wherein the second temperature is substantially higher than the first temperature.

37. (previously presented): The method of Claim 36, further comprising:

d) prior to step a), cleaning the surface of the titanium-based substrate with a caustic solution.

38. (previously presented): The method of Claim 36, wherein step b) is performed at a temperature of about 400° C, and step c) is performed at a temperature of about 700° C.

39. (currently amended): A method for forming an oxidation protective coating on a surface of a titanium-based substrate, comprising:

a) depositing an aluminum conversion layer on the surface of the titanium-based substrate, wherein the aluminum conversion layer is deposited at a temperature of less than about 550° C;

b) heat treating the aluminum conversion layer at a controlled rate, wherein the rate is from about 25 to 100° C per hour when the temperature during this step is above 500° C, to form a coated substrate comprising an outer alumina layer and a titanium aluminide layer, wherein the titanium aluminide layer is formed between the titanium-based substrate and the alumina layer; and

c) cooling the coated substrate at a controlled rate, wherein the rate is from about 15 to 60° C per hour, whereby cracking of the titanium aluminide layer is prevented.

40. (canceled):

41. (previously presented): The method of Claim 39, further comprising:

d) prior to step c), holding the temperature attained during step b) for a period of from about 5 minutes to 2 hours.

42. (previously presented): The method of Claim 39, wherein step a) comprises depositing the aluminum conversion layer to a thickness in the range of from about 0.5 to 40 microns, and wherein the titanium aluminide layer is formed to a thickness in the range of from about 1 to 80 microns.

43. (previously presented): A coated titanium-based substrate prepared according to the method of Claim 36.

44. (currently amended): An oxidation protective coating for a titanium-based alloy substrate, comprising:

a layer of titanium aluminide disposed directly on a surface of the titanium-based alloy substrate, wherein the layer of titanium aluminide comprises $TiAl_3$; and

a layer of alumina (Al_2O_3) disposed directly on the layer of titanium aluminide, wherein the layer of alumina has a thickness in the range of from about 0.5 to 5 microns, and having a uniform thickness.

45. (previously presented): The oxidation protective coating of Claim 44, wherein the layer of titanium aluminide has a thickness in the range of from about 1 to 80 microns.

46. (previously presented): The oxidation protective coating of Claim 44, wherein the layer of titanium aluminide has a thickness in the range of from about 2 to 15 microns.

47. (previously presented): The oxidation protective coating of Claim 44, wherein the titanium-based alloy substrate includes a braze disposed on a surface of the titanium-based alloy substrate, the braze comprises titanium, and wherein the oxidation protective coating is formed on the braze.

48. (currently amended): A titanium-based component, comprising:

a titanium-based substrate; and

an oxidation protective coating having a uniform thickness disposed on the titanium-based substrate, wherein the oxidation protective coating comprises:

a layer of titanium aluminide disposed directly on a surface of the titanium-based substrate, wherein the layer of titanium aluminide comprises $TiAl_3$; and

10 a layer of alumina (Al_2O_3) disposed directly on the layer of titanium aluminide, wherein the layer of alumina has a thickness in the range of from about 0.5 to 5 microns.

49. (previously presented): The titanium-based component of Claim 48, wherein the component comprises a panel of a heat exchanger.

50. (previously presented): The titanium-based component of Claim 48, wherein the component comprises a braze disposed on the titanium-based substrate, the layer of alumina is disposed over the braze, and the braze includes a solid solution of aluminum.

Amendments to the Drawings

The attached sheets of drawings include changes to FIGs. 2 and 5. These sheets replace the original sheets including FIGs. 2 and 5. In FIGs. 2 and 5, informalities in the figure titles have been corrected.

Attachment: Replacement Sheets